Tanzania - Kigoma Solar

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Overview

Identification

COUNTRY
Tanzania

EVALUATION TITLE
Kigoma Solar

EVALUATION TYPE
Independent Performance Evaluation

ID NUMBER
DDI-MCC-TZA-MPR-KS-2016-v01

Version

VERSION DESCRIPTION
Anonymized dataset for public distribution

Overview

ABSTRACT
The performance evaluation of the Kigoma solar activity was designed to answer questions about the implementation of the program and about outcomes that may have been affected by the program. Specifically, the evaluation sought to answer the following questions:

1. How was the Kigoma solar activity implemented?

2. How did outcomes differ at follow-up and change over time for the targeted group selected to receive the Kigoma solar activity versus the nontargeted group?

We sought to answer the first question by examining several implementation domains: (1) implementation processes and experience with the program, (2) installation of MCA-T-funded solar systems, and (3) service quality of solar systems. To answer the second question, we examined several performance domains: (1) electric and non-electric energy consumption and expenditures, (2) investment and economic activities, (3) human capital accumulation, and (4) economic growth.

The evaluation covered all seven types of potential beneficiaries of this activity, and included respondents selected to participate in the activity (targeted respondents) and a comparison group of respondents who were not selected to participate (nontargeted respondents). Nontargeted respondents were selected from distinct geographic areas to minimize the possibility of contamination. No additional efforts were made to select nontargeted respondents to be similar to targeted respondents; as a result these two groups of respondents may differ in significant ways on characteristics that might affect our outcomes of interest. The beneficiary types are (1) schools, (2) health centers, (3) dispensaries, (4) businesses in village markets, (5) fishers, (6) businesses that received loans from local credit institutions to purchase solar systems, and (7) households that received loans from local credit institutions for solar systems.

To address the first research question, covering implementation, we looked at differences in the implementation outcomes between the targeted and nontargeted groups and changes over time in those outcomes. We also examined changes in solar PV use between the interim survey and the follow-up survey among all targeted respondents. In addition, we compared the use and service quality of MCA-T and non-MCA-T PV systems at follow-up, comparing all MCA-T users with all non-MCA-T users, regardless of their group assignment. Last, we examined the challenges and benefits of participation in the Kigoma solar activity among those who reported using MCA-T systems at follow-up.

To address the second research question, covering outcomes in the performance domains, we compared outcomes between the targeted and nontargeted groups and analyzed how key outcomes changed over time. For most outcomes, this meant looking at change between the interim and follow-up surveys. We calculated an adjusted difference at follow-up and a "net change," which is defined as the difference between targeted and nontargeted groups at follow-up minus the difference between targeted and nontargeted groups at interim. This is similar to a difference-in-difference analysis. In some cases, we

collected information during the follow-up survey that was not collected during the first round of data collection. For these questions, we present only differences between the targeted and nontargeted groups at follow-up.

The performance evaluation utilized data collected from an interim survey (2013) and data from a follow-up survey (2015). The follow-up data are provided in this package. Key findings related to implementation include:

* Implementation generally occurred according to plan, but some key implementation challenges, such as the apparent limited use of an SMS marketing component and the lack of participation by surveyed fishers, limited our ability to evaluate some components of the activity.

* Solar PV use was common among those who received MCC-funded systems.

* As use of solar PV systems grows, so do expectations for their performance and capacity.

* Solar PV systems face quality issues, and a lack of maintenance and repair training may limit their utility and popularity.

Key findings related to performance include:

* The use of solar PV systems increased over time, among both targeted and nontargeted respondents, and was consistently high in the targeted group at interim and follow-up.

* Liquid fuel use was lower among targeted respondents than nontargeted respondents both at interim and at follow-up.

* Findings from the performance domains provide limited evidence of association between the Kigoma solar activity and improvements in outcomes related to investments, economic activities, and human capital accumulation for specific beneficiary types.

More details can be found in the final evaluation report: Vohra, Divya, Edith Felix, Duncan Chaplin, and Arif Mamun. "Evaluation of the Kigoma Solar Activity in Tanzania: Final report." Report submitted to the Millennium Challenge Corporation, Washington, DC: Mathematica Policy Research, February 2017.

EVALUATION METHODOLOGY
Pre-Post with Comparison Population

UNITS OF ANALYSIS
The unit of analysis was the beneficiary (which, depending on beneficiary type, could be a school, health facility, business, household, or fisher).

KIND OF DATA
Sample survey data [ssd]

TOPICS

Topic	Vocabulary	URI
Tanzania Electricity		
Solar power		
Energy		
Africa		

KEYWORDS
Energy, Electricity, Solar power, Performance evaluation, Tanzania, Kigoma

Coverage

GEOGRAPHIC COVERAGE
The survey covers a non-representative sample of respondents in selected districts of the Kigoma region.

UNIVERSE

The study population included schools, health facilities, businesses, households, and fishers in selected districts of the Kigoma region.

Producers and Sponsors

PRIMARY INVESTIGATOR(S)

Name	Affiliation
Mathematica Policy Research	

FUNDING

Name	Abbreviation	Role
Millennium Challenge Corporation	MCC	

Metadata Production

METADATA PRODUCED BY

Name	Abbreviation	Affiliation	Role
Mathematica Policy Research	MPR		Independent Evaluator

DDI DOCUMENT VERSION
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MCC Compact and Program

COMPACT OR THRESHOLD
Tanzania Compact

PROGRAM
The Tanzania compact, which ended in 2013, focused on three project areas: the transport sector, the energy esctor, and the water sector. The energy sector project focused on four components: (1) the distribution systems rehabilitation and extension activity, also known as the transmission and distribution (T&D) activity; (2) a customer-connection financing scheme initiative to facilitate lower-cost electricity connections in selected areas (hereinafter, financing scheme initiative or FS initiative); (3) promotion of solar power systems in the Kigoma region of mainland Tanzania (Kigoma solar); (4) installation of a new submarine cable connecting Zanzibar's Unguja Island to the mainland along with rehabilitation of various parts of the Zanzibar grid (the Zanzibar interconnector activity, or cable activity). Together, these components were designed to increase the availability of reliable and high quality electricity to people in mainland Tanzania and Zanzibar. This study focused on the third component, the Kigoma solar activity.

MCC SECTOR
Energy (Energy)

PROGRAM LOGIC
The key components of the Kigoma solar activity revolved around the design and implementation of the processes required to finance and distribute solar PV systems to key beneficiaries. These components were expected to affect a range of outputs, outcomes, and long-term objectives. Key outputs included access to electricity (measured through the number of solar PV systems installed) and technical capacity of end users (measured through the number of users who reported receiving any training). Expectations were that these outputs would in turn lead to improved key outcomes such as electricity coverage (measured through the use of solar PV systems), quality of service (measured through the availability of power and functioning of solar PV systems), and increased energy consumption (measured through the consumption of electric and non-electric energy sources). These outcomes would in turn influence beneficiary-specific long-term objectives, such as the revenue earned by businesses and fishers, the availability of vaccines at health facilities, the availability of after-hours study programs in schools, and per capita household income.

PROGRAM PARTICIPANTS
The survey covered respondents from each type of beneficiary that the Kigoma solar activity targeted: schools, health

centers, dispensaries, businesses in village markets, individual businesses, households, and fishers.The survey covered both respondents who participated in the activity (targeted respondents) and those who did not (nontargeted respondents).

Sampling

Study Population

The study population included schools, health facilities, businesses, households, and fishers in selected districts of the Kigoma region.

Sampling Procedure

Interim data collection sampled targeted schools, dispensaries, health centers, village markets, businesses within village markets, boat management units (BMUs), and savings and credit cooperative organizations (SACCOs) purposively, with priority given to villages with the most solar PV installations to maximize data collection efficiency (Busalama 2013). Individual businesses, households, and fishers were sampled randomly from SACCOs' and BMUs' lists of people and businesses that purchased systems. For all beneficiary types, corresponding nontargeted respondents were selected purposively. Nontargeted respondents were selected from distinct geographic areas to minimize the possibility of contamination. The follow-up survey targeted most of the interim survey respondents. For follow-up data collection, we decided to interview only individual-level respondents and did not re-interview SACCOs, BMUs, or village markets.

For more details on sampling and data collection, see Vohra et al. (2017) cited in the abstract above.

Deviations from Sample Design

There were no deviations from the sample design.

Response Rate

For the follow-up survey, we successfully re-interviewed 114 of the 122 individual-level interim survey respondents, for an overall response rate of 93.4% (96.3% in the targeted group and 87.5% in the nontargeted group).

Weighting

We did not produce or use any weights for these data.

Questionnaires

Overview

A survey was administered to all study participants. The survey was designed to assess a range of topics related to the implementation of the Kigoma solar activity and the activity's potential impacts on energy use and facility or household operations. The follow-up survey was based on the interim survey and included some additional questions about the experience of activity participants. In addition to the main component of the survey, which was delivered to all respondents, each beneficiary type was asked a small set of beneficiary-specific questions to better understand topics related to their operation, such as the number of students that schools had, the number of patients that health facilities served, and the daily revenue of businesses and fishers.

Data Collection

Data Collection Dates

Start	End	Cycle
2015-09-07	2015-11-09	N/A

Data Collection Notes

Pilot testing for the survey took place July 15-22, 2015. The majority of data collection took place from September 7-19, 2015. Remaining data collection took place during the week of November 9, 2015.

All data were collected using EDI's in-house software, Surveybe. Interviews were administered in the form of electronic survey questionnaires on hand-held computers.

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Data Collectors

Name	Abbreviation	Affiliation
Economic Development Initiatives Limited	EDI	

Supervision

A team of 8 interviewers conducted all surveys.This team was led by a team leader and a project coordinator with the assistance of a data processing officer.

Data Processing

Data Editing

EDI performed the first steps of data cleaning. The electronic questionnaires used for the data collection for this survey contained automated routing patterns and a large number of customized consistency checks that provided feedback to the interviewers while collecting data. These primary consistency checks flagged errors inside the questionnaire form and were used by interviewers and supervisors to cross-check collected data in the field. In addition, after the data had been cross-checked in the field by a second interviewer and the supervisor, and transmitted to the EDI headquarters, the data were checked on an ongoing basis by the data processing team using a range of secondary checks in Stata. An additional deeper check was also processed by the Team Leader in order to ensure that all inconsistencies and errors were detected. Whenever the data processing team found errors or inconsistencies, the team contacted the relevant field worker or respondent via telephone to clarify or to identify the correct response, and updated the corresponding interview file. The team furthermore cleaned, streamlined and translated 'other specify' values, open answers and comments, wherever it applied.

EDI submitted cleaned Stata datasets to Mathematica. Mathematica conducted additional cleaning on these datasets. Mathematica conducted additional cleaning of these files in Stata, which included checking the validity of variable values and ranges; verifying skip patterns; cleaning and back-coding common "other-specify" responses; creating binaries of categorical variables; and recoding skips, missing data, and other non-response values to standardized lettered indicators.

Other Processing

All data were collected using EDI's in-house software, Surveybe. Interviews were administered in the form of electronic survey questionnaires on hand-held computers. Automated routing and a large number of built-in consistency checks allowed the identification of errors and missing fields during the interview, while interviewers still had the opportunity to correct the response with the respondent at the source. Electronic interview files were transmitted to EDI's centralized data processing team on a daily basis. The electronic interview files are encrypted, thus interview information could not be accessed by third parties at any point during this project. The data processing team ran additional cross-checks over the data and provided instant feedback to the field teams on an ongoing basis.

Data Appraisal

Estimates of Sampling Error

We did not produce any estimates of sampling error.